**Stat and Data Analysis Chapter 9 Review**

1. What is Inference?

Making conclusions about a population from a sample

1. What is inference based on?

Sampling distributions

1. When dealing with proportions, what symbol represents the unknown population proportion (claim)?

P

1. When dealing with proportions, what symbol represents the sample proportion?

1. What is the formula for a confidence interval?

\*\* SEE CHEAT SHEET\*\*

1. What 2 things can you do to decrease the margin of error in a confidence interval?

Increase sample size & decrease confidence level

1. What does being 95% confident **mean**?

In repeated samples of the same size, 95% of the confidence intervals created will catch the true percent

1. What are the 5 steps to a test of significance?
2. Conditions
3. Hypotheses
4. Test statistic (Z score formula)
5. P-Value
6. Conclusion
7. What do these tests compare?

A sample percent to a claimed percent

1. What is the formula for a test statistic?

\*\* SEE CHEAT SHEET\*\*

1. What is a P-value? What is it really telling us about our sample?

The probability of getting our sample (or something more extreme) if the claim is true. It tells us how likely it was that we got our sample.

1. What is alpha (α)? What do we use it for?

Significance level. Used to determine if we reject or fail to reject Ho.

1. When do we reject our Ho? When do we fail to reject it?

Reject when p-value < alpha. Fail to reject when p-value > alpha

1. What does it mean the results of a test are **significant**?

Significant = reject Ho

1. I have a significance level of 0.10. I get a p-value of 0.08. Is it significant? What is my conclusion (reject Ho or fail to reject Ho)?

Yes, significant, reject Ho

1. I have a significance level of 0.05. I get a p-value of 0.08. Is it significant? What is my conclusion (reject Ho or fail to reject Ho)?

No, not significant, fail to reject Ho

1. If we reject our Ho at α=0.05, will we reject it at α=0.01? Why or why not?

Maybe. Not all values that are less than 0.05 are also less than 0.01. But some are.

1. If we reject our Ho at α=0.01, will we reject it at α=0.05? Why or why not?

Yes. All values that are less than 0.01 are less than 0.05 too.

1. Tests of significance are really looking for evidence …

Against the Ho (claim)

1. Whenever we do a test of significance or a confidence interval, what are the 3 things we ***need*** to check for?
2. SRS
3. Pop > 10n
4. N > 30 or normal population
5. What are the 4 steps of a Confidence Interval?
6. Conditions
7. Formula
8. Interval (a, b)
9. Sentence conclusion
10. I have a 98% confidence interval of certain data that is (0.65, 0.78).
    1. Give a POSSIBLE 92% confidence interval for the same data

(0.68, 0.75) interval gets narrower

* 1. Give a POSSIBLE 99% confidence interval for the sample data

(0.62, 0.81) interval gets wider

1. An entomologist samples a field for traces of a harmful insect by placing a square yard frame at random locations and carefully examining the ground within the frame for these traces. An SRS of 75 locations selected from a county’s pastureland finds traces of the harmful insect in 13 locations.
   1. Check the 3 Conditions:

1. SRS – Stated as an SRS√

2. *n* > 30 – 75 > 30√

3. *pop* > 10*n* – *pop* > 750√

* 1. Give a 95% confidence interval for the proportion of all possible locations that are infested, and interpret.



We are 95% confident that the true proportion of infested locations lies between 8.76% and 25.9%.

* 1. We read a magazine that claims that 15% of all possible locations are contaminated by this harmful insect. Knowing this, find the minimum sample size needed to calculate a 92% confidence interval with a 6% margin of error.



* 1. Using the claim in part (c), perform a test of significance to see if the true proportion of harmful insects has increased.

H0: *p* = 0.15

HA: *p* > 0.15



P-Value = P(*z* > 0.5659) = 0.2857

Since the P-Value is greater than alpha (0.286 > 0.05) we fail to reject the null hypothesis. We don’t have sufficient evidence that the proportion of infected land is more than 15%.

1. Find the minimum sample size needed if we want to calculate a 90% confidence interval with a margin of error of 4%.



1. Of the 500 respondent households in a SRS, 43% had less than 2 cars at home. There was a census done a few years ago that said that 46% had less than 2 cars at home.
   1. Check the 3 conditions:

1. SRS – Stated as SRS√

2. *n* > 30 – 500 > 30√

3. *pop* > *n* – *pop* > 5000√

* 1. Test whether the census is still accurate for the proportion of households with less than 2 cars at home or if it has gone down since the census was done.

HO: *p* = 0.46

HA: *p* < 0.46



P-Value = P(*z* < –1.3460) = 0.0892

Since the P-Value is greater than alpha (0.0892 > 0.05) we fail to reject the null hypothesis.

We don’t have sufficient evidence that the proportion homes with less than 2 cars is less than 46%.

1. Suppose that 84% of a sample of 125 nurses working the ER in city hospitals express positive job satisfaction.
   1. Check the 3 conditions

1. SRS – Not stated, assume it is a representative sample

2. *n* > 30 – 125 > 30√

3. *pop* > *n* – *pop* > 1250√

* 1. Establish and interpret a 90% confidence interval estimate for the ER nurses.



We are 90% confident that the true proportion of ER nurses that express positive job satisfaction lies between 78.61% and 89.39%.

1. You want to estimate the proportion of students at your college or university who are employed for 10 or more hours per week while classes are in session. You plan to present your results by way of a 95% confidence interval. Using the guessed value = 0.35, find the sample size required if the interval is to have an approximate margin of error of 0.05.



1. A recent study claims that by May, 65% of statistics students will have “senioritis.” You believe that this proportion is actually lower (one reason being that not all statistics students are seniors). You take a SRS in May of 93 stat students (between all three CB High Schools) and find that 42 of them claim to have “senioritis.”
   1. Check the 3 conditions

1. SRS – Stated as an SRS√

2. *n* > 30 – 93 > 30√

3. *pop* > 10*n* – *pop* > 930√

* 1. Test your claim at a significance level of 0.05.

H0: *p* = 0.65

HA: *p* < 0.65



P-Value = P(*z* < –4.0111) = 3.023 X 10-5

Since the P-Value is less than alpha (3.023 X 10-5 < 0.05) we reject the null hypothesis. We have sufficient evidence that the proportion statistics students with senioritis is less than 65%.

1. A company is marketing its new toy for children ages 3-8, however they are interested in the proportion of 4 to 5-year-old children like the toy. They take a SRS of 53 4 to 5-year-old children and perform a series of tests to determine whether the child likes the toy or not. They determine that of the children in their sample, 28 like their toy.
   1. Check the 3 conditions

1. SRS – Stated as an SRS√

2. *n* > 30 – 53 > 30√

3. *pop* > *n* – *pop* > 530√

* 1. Using a 96% level of confidence(*z*\* = 2.054), estimate the percent of children that like the toy.



We are 96% confident that the true proportion of children ages 4 to 5 that like the toy lies between 38.75% and 66.91%.

* 1. Explain what 96% confidence means in this context.

About 96% of random samples of size 53 will produce confidence intervals that contain the true proportion of children ages 4 to 5 that like the toy

1. We have a confidence interval is (0.03834, 0.12166). This interval is created from a sample of 150 people.
   1. What is the sample proportion?



* 1. What is the margin of error?



* 1. With what level of confidence was this interval created?



Multiple Choice Answers:

1. B
2. D
3. D
4. E
5. D
6. B
7. D
8. D
9. B
10. C
11. C
12. B
13. B
14. E
15. B
16. D
17. D
18. A